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Cutting and Punching Machines.

Iron plating is used at the present day in enormous quantities, in the construction of some of our most beautiful and at the same time most useful structures. As examples, both in Europe and this country, may be mentioned the Brittania and Conway tubular bridges in Wales, and the Victoria bridge in Canada, besides many lesser structures which are constructed entirely of numerous iron plates, nicely fashioned, punched and rivetted together, and strengthened with angle iron.

FIG. 1.

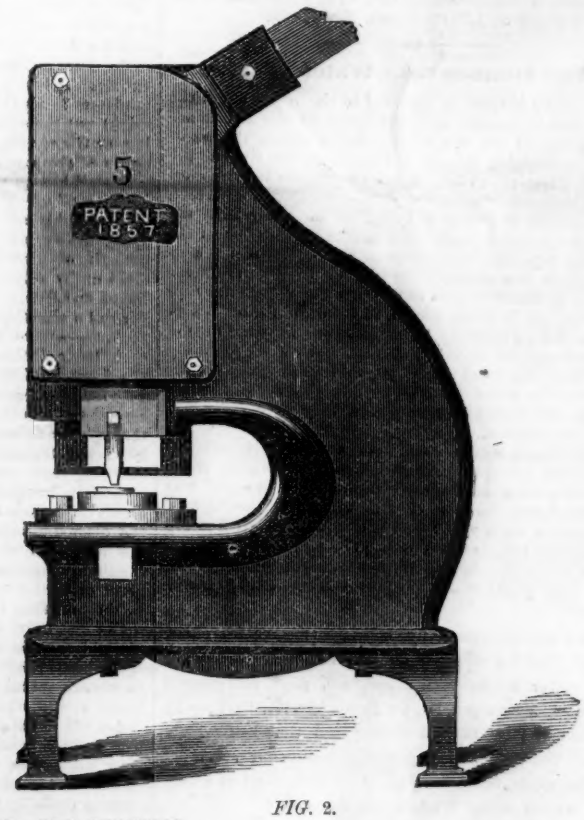

FIG. 2.

CUTTING AND PUNCHING MACHINES.

These structures have stood every test for strength and durability they have been subjected to for years.

Derricks, cranes, buildings, tanks, boilers, gasholders, etc., are constructed of iron in this manner, to say nothing of iron vessels of the merchant marine, and our powerful monitors and vessels of war.

The best engineering talent of the age has been and is employed in these mechanical enterprises, which have called forth a vast amount of mechanical ingenuity and physical labor, to bring them to the present state of perfection.

The fitting and conjoining of iron plates, to give coherence and strength, depends upon the manner they are perforated and secured by rivets, bars and braces, and it is this way greatest resistance is obtained with a small weight of metal. To drill the numberless holes required would be an expensive and endless task. Powerful cutting and punching machines are employed for this purpose, which wonderfully facilitates the labor and lessens the cost of the work.

Among the multitude of labor-saving machines employed for the adaptation of iron in the various structures into which it enters as a component in part or in whole, there are none that are more important perhaps, than the powerful and simple apparatus herewith illustrated, used for cutting and punching iron plates, bars, etc.

Figs. 1 and 2 represent a description of a punch and a shears patented by Mr. Stephen Taft, of Worcester, Mass., in 1857. The letters patent are now the property of Mr. Lucius Pond, of the same place, in whose hands these machines have received many improvements.

By referring to both representations, it will be seen (see Fig. 1) that the lower part of the main casting is a thick slab, with one edge surrounded by a heavy moulding forming a base, on which it rests in an upright position. The upper part of this main casting is a similar slab, offsetted to one side in such a manner as to allow a sheet of metal of any length, when being cut, to run clear, while the trimmings of the plate, depressed by the moving blade, pass beneath the offsetted portion. This arrangement allows cutting through plates of any width, and through any part of the plate. The upper part of the offsetted slab is formed out into a chamber to accomodate the moving parts. The piston is, in most varieties of these machines a thick block or slab, with two beveled edges, which fit into the sides of the chamber, one of which is fitted with metal packing and packing screws. The device for moving the piston attached to the upper shear blade (or the punch) consists of a pair of rolls made to move laterally within the chamber, one above the other, and in contact with each other, and with two inclined surfaces of hardened steel, one being attached to the upper end of the piston, and the other to the upper inner surface of the chamber. The rolls are made of the best Low Moor iron, with a thick tire of cast steel welded to them, which, being fitted and finished, are hardened. The lower roll is firmly riveted to the lever socket. On each roll is also secured a

malleable iron gear wheel, the pitch circle corresponding with the diameter of the rolls. The gears engage with each other, and with stationary racks above and below, thus insuring simultaneous motion, and retaining each in its proper position. These parts form a perfectly anti-friction connection between the piston and the lever, so that the whole force applied to the lever is economized in moving the piston, and the relation between the power and resistance remains the same during its entire movement, which is not the case with any form of crank, crane, or elbow joint connection, as usually applied to presses for punching or cutting metals. A pin, projecting a short distance from the centre of the lower roll into a groove in the cap on the front of the machine, serves to raise the piston on lifting the lever. (See Fig. 2.) It will be observed that the central point of control of the rolls and the two plates, together with the axes of the supporting sides of the chamber in which the force is communicated, are in the same vertical plane dividing the machine from side to side, and that the cutting edges of the blades are but slightly removed to the front of said plane in the shearing machine, while in the punching variety, where the punch is inserted in the centre of the piston, the point of resistance is in the plane. The comparatively small amount of metal required to give these machines great strength, makes their first cost less, and enhances their portability. They are adapted to every variety of metal—punching and cutting, from the thinnest plates to the five-eighths inch thick, as well as cutting up bars one and a quarter inch diameter for pins and bolts used as ship builders' fastenings, etc., thus performing the work of several smiths.

The improvements in these machines have been commensurate with the gradually increasing thickness of iron-plates, which can now be easily punched, and their rough edges smoothed off when one inch thick In the construction of boilers, iron steamers, and all plate-work, the punch and the shears are indispensable, and to be effectual and serviceable must be exceedingly powerful. Some well-proportioned and well finished machines of this class may be seen at the rooms of Mr. Lucius Pond, 85 Liberty-street, New York.

The Steubenville Water Works.

We have heretofore referred to the condition of the new water works, and especially to the excellence and power of the new engine that elevates the water which circulates through the city from the river to the distributing reservoir. From the engine to the reservoir the distance is 3,500 feet, and the elevation 96 feet. Any person at all versed in hydraulics will readily understand what an immense strain there must be on the conduit pipe from the pump to the distributing basin. The pipes now down, 3,500 feet in length, are fifteen inches in diameter, and came from the "National Pipe Works" of William Smith, Pittsburgh Penn. These works have a capacity to turn out one hundred tons of pipe of various calibre each day, and we are credibly informed that most of the gas and water pipes for the large cities in the North and South West are from these works, and that wherever placed they have given uniform satisfaction.

The water works committee are entirely satisfied with the promptness with which the contract made between them and the "National Pipe Works" was executed, and the fidelity with which the precise article agreed upon was furnished. So well satisfied are they that they esteem it a privilege to recommend these works to other cities, towns, and people desiring cast iron pipe for any purpose.—*Steubenville, (Ohio) Herald.*

[We are informed, by a private letter from Mr. Smith, that he supplied no less than thirty-three gas and water works with lamp-posts, pipe, and general castings, from April 1st, to December 1st, 1867;—the amount of pipe sent out during that time being 2,500 tons. Scarcely a day passes without our receiving similar evidence of the gigantic development of industrial wealth in the West.—Eds. Journal.]

Destruction of a Gasholder at Hull.—About half past two on Saturday afternoon, Feb. 1st, a huge gasometer, belonging to the British Gaslight Company, holding 240,000 feet of gas. was blown down by the violence of the gale and shattered to pieces. The violence with which the iron came together caused the emission of sparks, which set fire to the gas. Fortunately no person was injured. The damage done is very great. The numerous workmen engaged on the premises set to work vigorously to extinguish the fire by means of hose and stand-pipes kept on the works. Information being conveyed to the water works, which are hard by, a tremendous force of water was brought to bear on the fire, which was got under in the course of an hour.—*Lon. Jour. Gas-Lighting.*

The Aesthetics of Coal-Gas.

[Written expressly for this Journal.]

To many readers—fair or otherwise—the caption of this article will seem, as of itself, the very quintessence of things nonsensical. To *most*, in fact, the word gas-making suggests only dingy ranges of brick-work and black pipes, and huge cylinders of sheet-iron, and—worse than all these—monthly aggravations of temper by reason of the mysterious fluctuations of monthly bills. And, also, there are smells not altogether Arabian in their essence which do salute our nostrils now and then upon street-corners, and whose testimony goes far to stamp the art as altogether and hopelessly prosaic. So far do these simply *sensuous* arguments tend to strengthen any pre judging critic, that the advocate of the poetic and mystic angle of vision as affording the true, or at least the happier, view of gas-making may well wonder at his own temerity. Still, the play will have proved well worth the candle, if the office of the gas maker shall, through this his apology, be proved to possess all the far-spreading and comprehensive humanity of poor Prometheus. He has had for half a century his Jupiter in an inexorable Public; and now for the first finds (Ah, my blushes!) an *Aeschylus* to commemorate his adaptedness for a new epic. Now, between the 'fortes ante Agamemnona' and the 'fortes post Clegg,' intervene some thirty centuries of years, and about 14 tons of inspired bards, and it pleaseth me much to be the first advocate of the majestic poetry which lurks in all my theme. Were I a poet—Tennyson, suppose, or Longfellow—I would betake myself to the rush of choral anapaests to hymn it forth, but no scintilla of the bard's divine fire glimmers in me, and so I must write prose. It may be remarked, after thus breaking the ice, that it is most surprising how little *popular* attention has been given to a process which occupies so important a rank among the means of human comfort. Apart from the Pay-Lists of Gas Companies, how many are there who consider to what successive steps of manufacture they owe the flame which stands above their desk or their table, pure and radiant and unfluctuating—kindled or extinguished at a touch—the faithfulest of all their ministers? Cynic there may be, who will say, "You might put the same question regarding Mason's Blacking, or Ginger Pop:" and so we might and would, had either of these an equal dignity of value.

We all have a vague and unscientific notion that coal is the product of Nature's chemistry, working deep in unfathomable mines beneath the master finger of a God. Long before man knew here his home—when dank growths of gigantic fern sweltered amid poisonous miasms under a blazing sun, and vast misshapen forms of lizard and fish commixed, wallowed in the pestilential ooze of a chaotic earth, the coal-makers—the countless centuries—were busily at work. Broad rivers with their tranquil flow, and gigantean vegetation dwarfing the jungles of the modern Amazon, and torrid suns, and cloudless skies, and the all but living agony that convulsed a baking world, had each their part, and through the unbeginning ages constructed and accumulated the treasure-houses of fuel which are now discharging their pre-destined functions.

And it is most remarkable that the progress of discovery within two centuries as to the useful sciences has been commensurate, almost mathematically, with the extension of the consumption of coal. When Stephenson made practicable the employment of the great motor for railway purposes, the application acted by duplex effect to stimulate the mining of the British coals; not only, namely, as increasing the demand by the fuel used in every locomotive engine built, but as reducing the cost of transportation to such figures as to introduce coal as a fuel to new districts by an almost literal annihilation of distance.

Second to the system of railways only, in stimulating the production of coals, is the art of Gas-Lighting. In New York alone, including its offshoots within a radius of 10 miles from the City Hall, the *per diem* consumption of coals by the different Gas Companies may be roughly estimated at 1,000 tons, and in every land are springing up new manufactories which day by day call more unsatiately upon old mother earth to disgorge her hidden fuel. Hong Kong flashes with the same calm splendor which irradiates Sydney and beams in far Owhyhee, and the glittering maw of the retort glares in London as in Chili upon the swarth faces of the stokers that work this gigantic engine of human comfort and civilization.

The simple matter of-fact statement of gas-making may be thus expressed:—the coal is introduced into close vessels highly heated, when its volatile constituents are driven off, and after purification and measurement are collected in the gasholders for delivery to the streets and houses.

In this progressive treatment, the first thing which impresses us is the utter and irreversible change the coal undergoes. From a dense mineral we obtain as the primary product a compound gas of over 200 times its bulk, a coke (or residumm of solid carbon) bearing the proportion to the original coal of 125 to 100 by measure, and some five or six per cent. *by weight* of tar and water.

The whole relations of its atoms are changed by the agency of heat, the wonder-worker, whose alchemy has transmuted a compact solid at a stroke into a porous solid, an elastic fluid, and a liquid. Carbon and hydrogen in great part it was; carbon and hydrogen they remain;—the same and yet how altered! the same because of the eternal law that matter never perishes from out the universe—different because uniting to form new compounds. For coal-tar it may be said that there are some *fifty* separate compounds in it of these two elements, but so novel and so puzzling are their names that we pass by this most complex nuisance without venturing their recital.

Now this change, or series of changes, by which the vast vegetation of an aeon infinitely distant in the youth of our planet has become available as our grand storehouse of artificial light seems mysterious enough; and yet it is no more complete, though measured for duration by the noiseless lapse of a thousand centuries, and scarcely more mystical, than that which through the restless spirit of human research, with heat as its subagent, is completed in the fifth part of a single day. The first change is due to long-continued heat, and pressure, and absence of air and light in the silent laboratories of the inner earth, and is not so utter as to erase the stamp of organic origin. Delicate traceries of the strange fern-growths of buried ages and basso relievos of comical animal orgasms, have been brought down to us by the unimpeachable record of the coal-measures, and open up a glimpse of what our mother Gaia was while in her babyhood. And so this primal change, long as has been its duration, has not robbed it of an authenticity of origin, but testifies in Nature's own pictograph that the coals which now furnish our light and heat once shaded in feathery fern and stately pine, and interlacing brake, the gloomy haunt of many a languid monster, fabulous in his ugliness, but altogether adapted to his habitat by Him who doeth *all* things well. The agency of the second change named is simply intense heat acting under certain conditions; and in this the whole structural character of the coal is destroyed.

No trace of vegetable origin lingers in the coke, the gas, the water, or the tar. Shivered forever are the links which had bound the volatile and the solid—destroyed forever the print of fern-leaf and beetle—of pine cone and of frond. Like the change of the Chrysalis, this change is entire, yet in each of its phases the coal has a peculiar utility. The coke is equal, *pound for pound*, to its original in calorific power; the water holds free ammonia in heavy percentage; and from the tar, nuisance though it be to the gas-maker, are obtained the most brilliant coloring matter, naphtha, paraffine and many other useful substances. In this allotropism we find a strange evidence of the immortality of matter. *Nothing* ever dies, said the Brahmins, and it must be confessed that, arguing from analogy, they had much to adduce as basis for their creed.

It requires no great stretch of thought to supply the vivifying principle of an animal with the same attribute of a shifting shape of existence as certainly attaches to the muscle and fibre and tissue of that animal. Compensating and ever-renewing cycle there is in things palpable and material; may not there be similar compensation and renewal in the laws of life and of the intellect? I purposely use the word "*intellect*," and only as applying it to the extra-human animals; for we have so many and so coincident proofs of a high intelligence, that to me it savors of arrogance to deny the propriety of such an application.

Even in our study of human psychology, we find almost at every turn problems all too deep for human analysis; the well-authenticated cases of a dual existence, for instance, or the utter and apparently hopeless death of heart and of the affections which sometimes makes a blank in a man's life—or the history of the Convulsionists of St. Medard.

Instances, in fact, might be multiplied almost *ad infinitum*, of our ignorance of the laws of our own being; and we can hardly claim greater knowledge as to the inferior animals.

Returning, however, from this digression to our subject, we find that by just so much of *rapidity* as attends the evolution of the gas, is its quantity and quality to be measured. As the increasing temperature of the retort reduces the proper time of distillation—other conditions being the same—the amount of tar produced is lessened, and the illuminating value of the total gas-product is increased.

The gas is evolved from the coal with all the appearance of a dense brown vapor, and but little promise of the perfectly colorless purity which attends its last stages of manufacture.

The coloring substances, however, are only held in mechanical suspension by consequence of a high temperature, and pass off in great part before any application of the agents of purification. It is now the practice of the best engineers to pass the gas immediately to

the condensers, and *afterward* to the "washers," in which any lurking tarry or ammoniacal impurities are separated by their direct contact with water in the form of a mist or spray.

The final and most important process of purification is the separation of the compounds of sulphur by the absorptive power of the hydrate of lime, which process completed, the gas is measured and stored for distribution. It is somewhat surprising that in so important a manufacture, so few *radical* improvements should have been made in the past half of a century. Gas-making now is substantially the same as when the Chartered Gas Company of London fought its great battle with Parliamentary committees; and since Clegg, Winsor, Accum and Murdoch devised the original apparatus, there have been but two great improvements in the construction of gas works. In the early history of inventions we very frequently find the most absurd and sanguine visions entertained by their promoters; and Winsor's superb scheme of a "*National Light and Heat Association*" is perhaps the most goodly Utopia of them all. By the adoption of coal gas as the universal agent of illumination, through Governmental action and a suitable schedule of taxes upon those who did burn gas, and *those who did not*, the vastest source of national revenue was to be created, and the most fabulous returns to be secured by the corporators of this proposed association. I am, as usual, writing without references at hand, and may therefore be a little inaccurate; but the annual dividends were to be some £570 on each £5 paid in by the shareholder. It has been said that a couple of Yankee boys with no capital save a Barlow knife apiece, and without any "badges of a lost innocence" upon them, will by two hours diligent swapping of jack knives make the small fortunes—*each* of them—of $5, coin of the realm. Of some such stuff did Winsor believe his compatriots to be composed, and not only he but the sheep-like public of the dawning century also. Fortunately, however, the powers that were—big-wigged functionaries, perhaps, lately bitten in the South Sea scheme—gave a stern "No!" to his application for a Parliamentary grant, and the enthusiast went down impecunious to his grave. Coleridge's "Pantisocracy" was no more vast in its philanthropy—Law's scheme to make every Frenchman rich, no more fallacious; but the N. L. & H. A. has passed away unwept to a forgotten grave, while the other members of the triad yet live in the preserving amber of our literature.

If, however, there were inventors too sanguine, there were also opponents the most frantic in their absurd denunciations. A general howl went up that the fisheries would be destroyed, and with them the British Navy, of which they were the nursery. The proud pæan "Rule Britannia," etc., would settle back into the puny shriek of an Ariadne-like nation quaking on the ship-less shores of Albion. The new-fangled humbug of gas-lighting would do all this, and give as its recompense of reward a pestilential brilliancy, putting out peoples eyes with its glare, and ruining peoples lungs with its baleful sulphur-fumes. The noisome stenches and filthy overflows of the gas works would poison all God's creatures, whether fish, flesh, or fowl; and so, by and by, the whole terrestrial ball would be depopulated by the extension of this mad scheme. The words used may be varied, but certainly express none too strongly the cry of those whose motto was "*quieta non movere.*" And a few fatal accidents, occurring through the mechanical necessities of the new art, went far to popularize this opposition. By indomitable perseverance and great ingenuity, however, the fathers of gas-lighting gradually fought their way into favor, and the practical and financial success of the Chartered Gas Company stamped them as wiser than their noisy assailants.

In reflecting upon this triumph of theirs, we, of this day of improved machinery, can hardly value at their proper standard the difficulties in the face of which it was achieved. Lap-welded tubing was to be the growth of a later age, and the only mode of interior conveyance—*interior*, I mean, as regards the houses—was a clumsy system of gun-barrels screwed together. Castings of all sorts were enormously high in price, and wretched enough in quality; the gas meter was not yet thought out, and by consequence the subtle fluid was delivered by estimate; Parliament was not friendly to the innovation, and Parish Boards disliked the opening of the streets and highways for the purpose of laying down the arteries of conduit.

The invention of the meter was the pivotal question of success. It has been pronounced by no mean authority as an instrument most beautifully philosophical in its construction; and in theory it has always been so. It has been reserved, however, for the last decade to bring it to its present perfect shape, through the vast and increasing consumption of gas which made the question of just registration one touching the pockets of so great a part of the populations of our cities.

The quality and measurement of coal-gas has thus become favorite matters of discussion among law-makers and, among English municipalities, the "*terminus ad quem*" of any halting debate. Certain it is that a vast amount of most horrid rubbish has thus been entered upon municipal minutes, but the result has upon the whole been beneficial—*namely*, as determining standards of photometric measurement, and as fixing the *maximum* error of the meter at a figure almost inappreciably small.

The agitation has accomplished—in part at least—another desideratum in the dawning belief that Gas Companies and Gas Engineers are human, and not demoniacal in their moral qualities. Until within a very few years, the popular idea regarding them was that they *could not* be honest—that no good could come out of this Nazareth—that no Mercury could be whittled out of this most refractory block of wood. [I quote this last simply as a proverb of 2,000 years' repute, but am strangely tempted to cancel its somewhat unfortunate allusion to the arch-protector of footpads and thimble-riggers].

Absolute truth—which is not the truth of Carlyle's "Characteristics" and the "Diversions of Purley"—never yet did fear discussion, and usually comes out with renewed strength from every conflict with error. And so has it been in this case; the canvassing of gas-honesty has burnished up its armor and given dignity to its attitude; the appointing of sworn inspectors has quieted the nervous pulse of those who look with complacent toleration upon a two foot rule a quarter of an inch short, and have not quite eight scruples to every drachm, by which a pound weight undergoes the standard; and with every fresh restriction the past rectitude of Gas Companies becomes more apparent to their patrons.

My only object is to satisfy the gas-maker that his profession is one which possesses sentiment and beauty. If this article serves to bring peace to one breast, or a comfortable self-respect to the natural poets, one or two of whom I have the distinguished honor of knowing in the profession, my aim is accomplished. Valete!

J. R. S.

Dr. Whitmore's Report

ON THE QUALITY OF THE GAS SUPPLIED IN ST. MARYLEBONE, IN DECEMBER, 1867.

December.	*Mean of 24 Observations.	Highest.	Lowest.	Highest.	Lowest.	Mean amt. of Sulphur in 100 cub ft.
Imp. Co.'s Gas.....	15.57	16.84	15.06	25.48	9.75	21.60
Chartered Co.'s common Gas.....	13.23	13.87	12.39	34.28	14.27	26.65
Chartered Co.'s Cannel Gas...	21.10	22.79	20.07	38.23	13.56	22.84

* Each observation consists of 10 readings of the photometer.

The excellent illuminating power of the Imperial gas—as determined by photometric observation—during the past year, has been fully maintained during the month of December. The mean light, as the table shows, was equal to 15¼ candles, or nearly 30 per cent. above the standard; and on no occasion did it fall below 15 candles. The pressure was generally good, but the testings for sulphur showed 2·60 grains more of this impurity than what is permitted by law. The mean illuminating power of the Chartered common gas was equal to 13·23 candles, and on no occasion did it fall below the standard; its pressure was uniformly good, but the result of three testings showed an excess of sulphur to the extent of 6·65 grains. The cannel gas of the same company gave a mean light equal to 21 candles; its pressure was satisfactory, but in this gas also the sulphur was excessive.—*Lon. Jour. of Gas Lighting.*

JETS OF NAPHTHA.—An artesian well of naphtha has been discovered at Kudaco, in the Caucasus, by boring. At the depth of 274 feet from the surface the liquid was first struck, and for a whole month gave a supply of 1,500 barrels daily. Since then a fresh source has been met, which rises with irresistible force to the height of 40 feet above the ground, the jet being four inches in diameter, and delivering a daily supply of 6,000 barrels.—*Builder.*

TRINIDAD BITUMEN AND CHEAP GAS.—A limited company appears to have been formed for the purpose of working the bitumen lake of Trinidad, which belonged to the late Earl of Dundonald, as a substitute for bog-head mineral in the improvement of gas from coal. Mr. A. A. Cochrane, of Westminster, it is reported, has succeeded in obtaining excellent results, although the bitumen in its natural state contains about 23 per cent. of water and 28 of ash, with a good deal of sulphur. The application of bitumen to coal in the economization of gas has been patented by Messrs. Cochrane & Upward.—*Builder.*

Practical Management of Gas Works.

BY JAMES R. SMEDBERG.

[WRITTEN EXPRESSLY FOR THIS JOURNAL.]

NUMBER FIVE.

Since the preceding article of this series was penned, I find that a remark toward its close was more sweeping than Mr. Banister's observations warrant; and I cannot more appropriately rectify my error of memory than by actual quotation from "Gas Manipulation" [2nd Ed'n, p. 113].

> "It has already been stated that the discharge of "gas through small orifices is as the square root of "the pressure, but that this does not hold good *with* "*fishtail and batswing burners below six or seven-*"*tenths pressure.*"

This is followed by a tabulated statement of experiments which have no present interest.

The explanation of the phenomenon in the case of clay retorts, must probably be sought (Ronalds & Richardson's Chemical Technology, vol. 1, p. 594,) from the law of the transpiration of gases, or their passage through capillary tubes, established by Graham. According to this law, the denser or more compressed the gas, the more quickly it is transpired; and 9 : 2 :: 21 : 4.7, or nearly 5, as observed in the experiment.

At the time of beginning some articles for this JOURNAL eight years ago, I wrote some frightful stuff about the care necessary in treating clay retorts. Since then I have brought retorts of Brick's and Gautier's make to full working temperatures in 36 hours after the first fire was kindled in the furnace, and would have no hesitation in doing so again if circumstances should require.

The leakage of gas through clay retorts is not a serious objection to their use, as it occurs mainly just after the removal of carbon, and the application of fire-clay to the interior fissures will render the retort thoroughly gas-tight. A retort, indeed, broken transversely through the center is as serviceable, *if the fracture be a clean one*, as ever; for the pieces may be satisfactorily joined with fire clay. When charging a retort for the first time, we used, years ago, to introduce a dirty mixture of tar and coal, repeating the operation after each removal of carbon; but the proceeding is seldom adopted now.

For stopping the larger cracks a mixture of five parts of fire-clay, one of borax (fused and finely ground), and two of fine white sand, may be advantageously employed, instead of the simple clay.

Ordinary cement, composed of fire-clay and borings, also answers this purpose tolerably; while in Muspratt's Chemistry (vol. 1, p. 137) the following mixture is highly recommended:

	Per cent.
Fire-Clay.....	42.5
Loam Sand.....	42.5
Powdered Glass.....	10.0
Chloride of Sodium.....	5.0
	100

This compound to be thoroughly ground up with water.

CONCERNING THE PREVENTION AND REMOVAL OF CARBON.—In the use of clay retorts without an exhauster, three elements combine to form carbon more rapidly than in irons, viz.: PRESSURE, *porosity* and *temperature*. I name the three in what I believe to be the order of their relative importance.

Now, to keep the carbon down to a slow rate of formation is a great desideratum, just as prevention is better than cure. Here we are at once confronted by the dip-pipe seal. We all know how valuable this principle of sealing up the aeriform fluids by denser ones, through which they can pass in one direction, but not in the other, is applied through all the forms of apparatus; and know also that the only injurious effect of this intercepting device is its back-pressure upon the retorts.

All sorts of plans have been devised for the actual *removal* of this seal during the distillatory periods. We have had Kirkham's expensive and cumbrous system of by-pass valves—we have some forty applications of a seal-cup actuated vertically by a rod passing through a stuffing box in the bridge-pipe stopper—we have lately suffered patents for the alternate flooding and discharge of the hydraulic main; and the whole of them are unadvisable, *because unsafe*. The fact is that a breakage of a clay retort does sometimes occur when its charge is half spent, and it would be as unpleasant to have a torrent of gas blowing into a hot arch, as to ruin your gas by sucking the gaseous products of combustion into the connections *Without* an exhauster, the first—*with* one the second—would happen.

Now, occupying the stand point of the necessity of this seal, what recourse have we? Simply to reduce its obstructive effect to the least possible figure. This is to be done as follows: Carry the intermediate

and end piers continuously up from foundation to the point where they receive the castings which support the hydraulic main; level the main itself with the utmost care; have the dip-pipe castings cut, *in a lathe*, to absolute uniformity of length below the flanch; make the flanch joints of uniform thickness; and, having seen carefully to these matters, deliver the condensed products through some such "Adjustable Tar Valve" as was illustrated in this JOURNAL for February 3d, 1868.

There are high names at my back in this position: Sabbaton, of the Manhattan—Ohrens—Edge, of Jersey City—White, of theMetropolitan—and probably a good many others of equal standing.

All this being done, you can *safely*, in a suitably proportioned main, cut your dip-pipe seal down to an inch of tar; and this, in the absence of an exhauster, and with large retort-connections, is a trivial obstruction compared to *a little* too much water with your lime—*a little* too thick stratum of lime on your trays—*a little* want of care in keeping your purifier-connections clean—or a worn meter-journal. So *without* an exhauster the dip-pipe seal amounts practically to nothing, while *with* an exhauster you can safely speed it so high as to reduce the pressure on the retorts to three-tenths of an inch of water. I know whereof I do affirm, because I have seen the thing in practice.

THERE ARE CLAY RETORTS IN THE 18TH STREET STATION OF THE MANHATTAN WHICH WORK UNDER ONLY *one-tenth* PRESSURE. THEY HAVE BEEN IN WORK SIX MONTHS, AND SHOW NO PERCEPTIBLE FORMATION OF CARBON ON THEIR INTERIOR SURFACES.

So what is the use of "automatic" valves, or of valves worked by hand, or of any sort of substitute for the admirable—indeed, *exquisite*—contrivance of the dip-pipe seal? Like a very much more distinguished individual, "I pause for a reply."

And now, having disposed of the question of prevention, let us discuss the removal, of carbon.

The first and most obvious mode of introducing oxygen to the retort was by simply removing the lid and allowing atmospheric air to enter at will (L. J. G. L. vol. I, p. 174). This carbon question was next sought to be solved by "through" retorts, which possess the advantage of economizing 18 + 4 + 4=26 inches of carbonizing length (L. J. G. L. vol. IV. p. 2) Then came the insertion of a 4-inch pipe through a lid which was luted home, and a current of air delivered fair against the carbon at the rear of the retort—the draft being secured by removing the back stopper of the bridge-pipe. By selecting this stopper, the retort, the stand-pipe, and the bridge-pipe are simultaneously freed. The pipe employed was at first of iron, but tubular fire-tile of a foot in length are now employed, at least in American practice.

The air-blast is better, because more rapid in its action, and has been employed in the works of some of the larger English companies.

Various applications of steam have been recommended. Mr. PRATT, of the St. Louis gas works, uses, or *did* use, a steel scraper after each charge, and he claims that the carbon is thus kept down to a mere film, without the loss of a single hour of retort-service. A substantially similar method is quite generally practiced among Scotch engineers. Any engineer who charges two scoops to the retort must have noticed the cutting away of the carbon on each side. Mr. William Mellor, of Leighton Buzzard, England, proposes to attack carbon with a watering-pot. Here is his letter in full. (L. J. G. L. vol. VIII, p. 82):

"SIR: I see in answer to a country superintendent "in the last JOURNAL respecting the carbonaceous "incrustation on clay retorts, your advice is to burn it "off. This is a tedious way, and in small works they "often cannot spare a retort for several days, some-"times not even for hours, particularly if they have to "send out 26,000 feet in the 24 hours, and had only "gasholder room for 12,000 feet, as I have done. My "plan for scurfing clay retorts is both simple and effec-"tive, and by it I can generally get carbon off 6 or 8 "inches thick in from six to nine hours. As soon as I "have drawn coke from the retort to be scurfed, I cover "the bottom all over with about three inches thick "of ashes or breeze, and near the mouth I allow the "ashes to reach within 3 inches of the top of the mouth-"piece. I then take a 6 or 8-foot length of 1-inch "tubing, with a bend on the end outside the retort, "and having ready a water pot filled with water, I "pour in three or four pots of water. The steam from "the boiling water will very soon loosen the carbon, "so that it will drop off in pieces from a quarter to a "half hundred weight, if on very thick. The ashes on "the bottom will prevent the water touching, and so "damaging the retort. The only precaution required "is, not to let the tube get hot before pouring in the "water; otherwise the water will fly back, and proba-"bly scald the man's hand; but should the water return "thus, then it will be only necessary to take the tube "out, and lay it aside for half an hour or so, to cool, "before trying it again. By repeating this operation, "you will get your retort perfectly clear by stopping "only one charge. I have adopted this mode for about "14 years, and have had many inquiries as to how I "managad to keep my retorts so clean. W. MELLOR."

Now this performance I have tried, and I unhesitatingly endorse his statement that "the water will fly back and burn the man's hands." But as the man's hands were *my* hands, and as one of Keller's beautiful retorts came to additional grief, I cannot conscientiously advise any of my brother engineers to be beguiled by Mellor.

A charge of oyster-shells, I am told, serves by its evolved gases to crack or scale off the carbonaceous deposite; but I am personally ignorant of the method, and therefore pass it by with this brief mention.

Mr. Edge, of the Jersey City Works, known to the gas-world of the East as a most careful and successful engineer, thus refers to the advantage of using his compound jet (of air and steam).

> "This process, if carefully conducted, will produce "all the results here claimed for it, and I earnestly "recommend to all managers using it, the import-"ance of the system of burning out the retorts every "thirty days. The operation is then performed in "less than *one hour*, and the carbon contained in the "body of the retort is not at all effected. This is "the great desideratum, for in this way the composi-"tion of the retorts is changed (by the carbon which "permeates them), thus acquiring a metallic char-"acter and hardness, their strength and durability is "increased, they are not affected by the highest tem-"perature, and are rendered almost indestructible; "the production of gas is, likewise, very materially "increased."

An illustrated pamphlet giving the full features of this patent may be obtained upon application to Geo. W. Edge, Engineer Gas-Light Co., Jersey City, N. J.

Now, I think that the Manhattan Company's results prove, *beyond possibility of cavil*, that temperature *alone* has very little to do with the deposition of carbon. There are other facts (of illuminating values) which clinch the question in my mind, and prove to a mathematical demonstration that a ton of coal distilled under such very low working pressures, gives the highest possible equivalent of sperm.

The Manhattan charge about 250 lbs. every 5 hours to retorts 20 x 12 x 8 feet 6 inches long. The exhauster works at twenty-tenths vacuum.

I believe myself to be the first Engineer who has publicly supported by sledge-hammer facts the broad ground that PRESSURE AND POROSITY sufficiently account for the deposite of carbon; and will go further, and express my conviction that if clay retorts could be coated with a *permanent* enamel, there would be no necessity for forming any carbon whatever.

I may be laughed at for this, but ridicule is no fair argument, and I will be very happy to show any advocate of the "Temperature Theory" such evidence as he little expects for my own views.

As to the question of enameling, Messrs. Maurer & Weber claim to have successfully done so; and I shall most assuredly test their fabrics on a working scale, if I ever exchange the pen for the charging-scoop, and return to the practical management of gas-works—in reality, instead of on paper.

Purification of Gas.

[From "Clegg on the Manufacture of Coal Gas."—Fourth Edition.]

(Continued from page 227)

The following details of a dry-lime purifier, as given in the specification of the Great Central Gas Company's Works at Bow Common, presented to the Parliamentary Committee, may be taken as a good illustration of the construction of such purifiers for works of that magnitude.

Bottom Plates.—Sixteen in number, so that when joined together they will be 12 feet square, $\frac{3}{8}$ in. thick, with flange all round, $2\frac{1}{2}$ inches broad, clear of the plate, all firmly bolted together, $5\frac{1}{8}$ bolts six inches apart, centre to centre, with strengthening brackets, one between every two holes. One of the bottom plates to have a hole in it 14 inches in diameter, with a cover-plate standing 9 inches high, and 24 inches in diameter, made fast over the hole by 6 15-inch bolts, with a collar three inches from each end, the one to rest upon the bottom, the other to support the cover-plate and made fast to each end of the cover-plate and bottom-plate by $\frac{3}{8}$ nuts screwed on each end of the bolt. One bottom-plate to have a hole 12 inches in diameter, with ears, lid, and cross-bar, the same as a retort mouth-piece, for the purpose of opening from beneath as a discharge-hole

Side plates to bolt on the bottom-plates and stand, 4 feet 2 inches deep on the inside of the purifier: sixteen plates to form the sides, having a water-lute cast on 8 inches broad, 1 foot 6 inches deep inside all round these plates, to be $\frac{3}{8}$ thick, with flanges $2\frac{1}{2}$ inches broad clear of the plate; the whole to have fillets between every two holes, being six inches apart centre to centre. Two side plates in each purifier to have a flange outlet 14 inches diameter, cast on, standing out 9 inches; the flange to be $2\frac{1}{2}$ inches clear of the pipes; the bottom of the pipe on the inside to be on a level with the bottom of the purifier. On the inside of this plate are to be cast two flanges, standing the whole height of the plate, $2\frac{1}{2}$ inches broad, and 14 inches between them; these flanges to have $\frac{3}{4}$-holes in them, every 9 inches in height, for the purpose of receiving bolts to fasten them on the outlet-box.

Outlet box to be 4 feet deep by 12 inches square, with a $2\frac{1}{2}$-flange at the bottom, for bolting it to the bottom of the purifier; the bolts to be $\frac{3}{4}$ths, 6 inches apart centre to centre.

Snuggs to be cast upon the side plates at given heights, for the purpose of resting a tee-iron into, upon which the trays will rest, projecting 4 inches and 6 inches deep; 40 bars of 4-inch tee iron, each 12 feet long, to rest upon the snuggs, cast upon the inside of the side plates, and not to be fixed by any bolting.

Trays to be four in number to each purifier, in squares of 3 feet by 3 feet, making 16 squares to each tray; these squares to be formed of 2-inch flat bar iron, half an inch thick, as an outside frome, with $\frac{1}{2}$-in. cross rods. This frame to be fitted in with $\frac{1}{2}$ inch round rod, with $\frac{1}{2}$-inch spaces between, properly riveted at each end, through the framing with counter-sunk heads.

Cover to be constructed of a square frame of 3-inch angle-iron, 12 feet 10 inches on the side, with a square frame of 3-inch flat bar in the centre, 4 feet on the side. These two frames to be joined by 3-inch tee-iron bracing, made fast with $\frac{1}{2}$-inch rivets. Eight 1-inch eye-bolts, with collar above the screw, to be passed through the angle iron, and made fast by a nut on the inside for the purpose of lifting it by. This skeleton to be covered with sheet-iron $\frac{1}{8}$ of an inch thick, with $1\frac{1}{2}$ inch lap, inlaid with twine saturated with red lead, and made fast with $\frac{3}{4}$ inch rose-headed rivets, $1\frac{1}{2}$ inches centre to centre; the plates on the top to lap on the angle-iron 2 inches, and to be made fast to it with $\frac{3}{4}$ inch rivets, $1\frac{1}{2}$ inches apart, centre to centre, the sides to be 3-10 in thickness, and lapping on the angle-iron to the same depth, and rivetted with the same size rivets. A binding rim of $1\frac{1}{2}$ inch half-round iron to be fastened to the outside of the side, at the bottom, by $\frac{1}{2}$ inch rivets at 6 inches apart.

Water lute, 16 inches deep and 6 inches wide, to be constructed on the top of the lid, The whole of the above work to be of the best iron used for such purposes, free from cracks or flaws and geometrically true; the bolts to be all properly lapped with hempen washers saturated in red-lead and boiled oil, and good strong threads on them; the joints to be made of good clean iron-cement firmly caulked in. The plates of the cover to receive a coat of red-lead and oil at the joinings inside, and two coats all over the outside, and the whole made perfectly gas-tight, fitted up complete, and guaranteed for twelve months. The weights as under for each purifier:

	tons.	cwt.	qrs.	lbs.
Cast-Iron.				
Bottom plates, flanges and fillets complete	2	1	2	21
Side plates, ditto ditto	4	9	0	1
Two outlet-boxes	0	5	1	19
	6	16	0	13
Wrought Iron.				
Tee-beam to support sieves	1	6	2	17
Sixty-four sieves	3	4	3	12
Cover, framing and bolts complete	1	3	0	2
Cleaning lid, cross-bar, ears and screw	0	0	3	18
Bolts and rivets in all	0	4	1	4
Total weight	12	15	3	10

There were two such dry-lime purifiers, and four wet lime purifiers included in the specification.

Many ingenious arrangements have been contrived to pass the gas from one purifying vessel to another, whilst the trays containing the lime are removed, and the foul lime is replaced by fresh. This is done either by a hydraulic valve, or by slide-valves, or works.

The arrangement of valves connected with this part of the apparatus is of consequence. One hydraulic valve is preferable to four or more slide-valves, because if the man whose duty it is to attend to the latter were to shut those leading to the spent purifiers before he opened the others, the consequences might be serious. The sudden check thus given to the passage of the gas from the retorts would drive the tar from the hydraulic main up to the dip pipes into the open retorts, if there were any not in use, and most probably do much injury. Several accidents have arisen from this cause. With the one hydraulic valve this accident cannot occur, for it is impossible to close one partition without opening another.

Several contrivances have been invented for the purpose of simplifying the working of the purifiers, and especially to change the current of gas from one purifier into another, so that only one need be thrown out of work at a time, the gas being made to pass by a change of the valves successively from the foulest to the cleanest purifier.

Messrs. Cockey, of Frome, have contrived an arrangement of purifier valves, which is very simple, and has been found to work with ease and efficacy. These

valves may be applied also to gas-holders with much advantage. When connected with four gas holders, as at the Salisbury Gas-works, each valve takes the inlet and outlet of one gas-holder, and is provided with an index showing which way the gas is passing. The index is marked "in," "out," "in and out," and "stop." In the same house are placed the governor and the meter, and the person in charge of the works has, therefore, all the essential parts under his eye.

In Walker's arrangement of purifiers with centre valve, the centre valve is made in three parts. The lower chamber, which is divided by partitions into separate compartments leading to the pipes forming the inlets and outlets of the purifiers, is accurately surfaced on its upper horizontal face. The upper part consists of a circular chamber, which has an inlet through which the foul gas is admitted. The valve inside this chamber, which is also divided into corresponding compartments, accurately surfaced on the lower horizontal face, covers and works upon the lower chamber. It has one opening right through it which constitutes its inlet, through which the gas flows down into the inlet of the first purifier. This upper circular chamber may be turned round by a spindle that passes through a stuffing-box. After passing through that purifier the gas enters the next opening in the centre chamber, and by means of the divisions of the valves passes into the adjoining opening which leads to the inlet of the next purifier, and after passing through that purifier returns to the centre chamber to pass into the third purifier. The gas thus purified returns once more to the centre chamber, and if there are four purifiers in the series, into the outer one, which has an outlet pipe in the side leading to gas-holder; thus leaving one purifier ready to be cleared. When the last purifier is foul, the valve is moved partly round so as to bring the inlet to the second purifier, which cuts off the gas from the third one, and it then passes through three of the purifiers, entering the fresh-charged purifier last.

The outer case is properly surfaced and made easily removable, to permit access to the internal parts at any time. When arranged to work three purifiers, the gas passes through one, the other being shut off; and whatever the number, one purifier is always shut off to be cleaned and recharged.

The whole of the pipes are brought in straight lines to and from the purifiers to the central valve, which has sockets cast on it to receive them.

The purifier covers are raised and shifted out of the way by the central crane, which works on a pivot stepped into a short tripod girder, which supports it, and by this means the cover may be raised without difficulty.

Mr. Alfred King, of Liverpool, among his many ingenious contrivances to improve and facilitate the manufacture of gas, has effected an arrangement of the pipes of purifiers which is extremely convenient when the construction of the works will allow of its adoption. The purifiers are placed on an upper floor, and the pipes and valves connecting them are brought underneath, so that they are exposed to view, and are easily accessible when any changes, alterations, or repairs are required.

The great weight of the covers of the dry-lime purifiers, which when twelve feet square weigh upwards of one ton, makes it necessary to employ machines for lifting them. Cranes, pulleys, and other mechanical contrivances are employed for the purpose, but there is none more compact and more generally applicable than the lifting machine contrived by Messrs. Cockey. The mechanical power is gained by a winch and cog wheels and screws. The turning of the handle of the winch communicates motion to the vertical screw bars, which turn on swivel joints where they are connected by hooks to the covers of the purifiers. By this means the covers can be easily raised, and as the machine traverses on rails fixed in the floor, it can be easily wheeled on one side whilst the trays are being removed. Four purifiers should be placed in a row, so that the machine may be wheeled from one to the other without difficulty; and by means of a curve in the rails at the end of the range of purifiers, the lifting apparatus might be made to traverse from one range to another, and thus the covers of all the purifiers might be lifted with one machine.

Four wet-lime purifiers are necessary, two being in action and two out, alternately. When the purifier is spent through which the gas first passes, shut it off, and open a third, leaving a second to perform the duties of the first, and so on. The following extract from the journal of Mr. Clegg, sen., will give his opinion on the construction and use of lime-machines:

"The grand principle of the construction of a lime-water purifier is to divide the gas as minutely as possible, at the same time avoiding unnecessary pressure. If the machine be well constructed, seven or eight inches pressure in each machine is quite sufficient. Two sets are necessary, in order to have a pair clean and ready for use. The practice of working the contents of the vessel over again, by passing them from one to another, is mistaken economy."

The work performed by a lime-water purifier is generally computed by its contents in gallons, and the head of water or pressure opposed to the passage of the gas through it. Taking the latter at a constant quantity of eight inches, the computation is easy. Thus, 4500 cubic inches of hydrate of lime (which has been before stated to be the quantity produced by reducing one bushel or 2150 cubic inches of quicklime), mixed with forty-eight gallons of water, will purify 10,000 cubic feet of gas, if properly applied. In the example shown the lime-machine contains 316 gallons, which will hold in suspension thirteen bushels of hydrate of lime, and purify 65,000 cubic feet of gas. Two of these machines will therefore purify the same quantity of gas as the three dry-lime purifiers before mentioned, viz. 130,000 cubic feet.

To reduce the operation of one of these machines to theory, the gas should be so divided that each atom of sulphuretted hydrogen should be brought into close contact with its equivalent atom of lime; the chemical change would then be effected instantly, a hydrosulphuret of lime being formed, and the depth of water holding the lime in solution need not exceed that of a single atom. It is impossible practically to effect this perfect contact, but we can approach in some considerable degree towards it, by allowing the gas to pass through the liquid only in small bubbles, which is effected by the ring and plate touching each other within half an inch, the gas being made to pass through this annulus. In some machines the gas is allowed to pass through the lime-water in masses, as it would escape from under the plate if no ring confined the space; then the purification would not be effected by double the pressure, because the atoms of sulphuretted hydrogen would not be brought into contact with their equivalent atoms of lime; a quantity would therefore escape through the machine unchanged. The most essential thing, then, to be attended to in the construction of both dry and lime-water purifiers is *surface*.

Even when the quantity of lime required is well known, it is necessary to *test* the gas in its progress through the various purifiers. In some cases it is advisable to use the test every twelve hours, or oftener, in districts where the coal is of inferior and various qualities. Every morning, as soon as the superintendent arrives at the works, he ought to test the action of his purifiers, more especially if he has received a fresh supply of coal or lime. A saturated solution of the acetate of lead in distilled water is an excellent test for detecting the presence of the minutest quantity of sulphuretted hydrogen, and is more convenient than the carbonate, from its complete solubility. Test-papers may be printed in the following form:

Station and Date.

Crude Gas.	1st Purifier.	2d Purifier.	3d Purifier.

Lime-machine having been charged — hours with — bushels of lime.

The paper of the third purifier should remain colorless.

(To be concluded.)

Detroit Water Works.

REPORT OF COMMITTEE ON SUPPLY OF WATER.

To the Board of Water Commissioners:

Your committee, to whom was referred the report of the engineer at the pumping works, in regard to the formation of ice on the strainer over the river end of the inlet pipe to the pump well causing, during the winter months, frequent interruptions to the flow of water into the pump well, report that they have had the same under consideration during the past season, and before proceeding to state the efforts made to remedy the difficulty, we will give a brief description of the inlet pipe, and the nature of the difficulties encountered up to the time the subject was referred to us. The inlet pipe to the pump well is made of boiler iron; it is thirty inches in diameter. Its extreme length is about two hundred and twenty feet, extending into the river one hundred and fifty feet from the wharf, into water thirty-four feet deep at the extreme end. On the river end of the pipe there is a bell shaped mouth elbow, turned upwards, the end of which is thirty-six inches in diameter, over and surrounding which there is a strainer, also made of boiler iron, nine feet in diameter, and ten feet high. Above the end of the pipe the boiler plate in the strainer is perforated with half inch holes, one hundred and forty-four to the square foot. Surrounding the mouth of the pipe, and inside the shell of the strainer, there is a diaphragm plate with similar holes. Below this diaphragm plate the shell of the strainer has four-inch holes, to allow the sand to pass through, so as not to bank up on the outside of the strainer. Surrounding it are some thirty spiles, firmly driven at various intervals, to protect the strainer from the anchor of vessels; and the pipe, for similar protection, has a row driven upon each side of it, the space between filled with building stone. The water is drawn from the well by a steam pumping engine. When the engine is pumping, the water is required to pass through the holes in the strainer at the rate of one hundred and twenty barrels per minute, to furnish a full supply. The water is twenty-five feet deep over the top of the strainer; the current of the river about three miles per hour.

Under certain circumstances, during extreme cold weather, it is with difficulty a supply of water can be obtained, in consequence of the accumulation of ice on the strainer, frequently requiring the speed of the engine to be reduced, and at times to stop it for several hours together, no water passing through the pipe into the well, notwithstanding the bottom of the well is twelve feet below the surface of the river. The size of the well is about forty feet long, eighteen feet wide, and twelve feet deep. The circumstances under which the difficulty occurs are, when the weather is cold, and ice is forming in the lake above, and on the shores of the river, and the river is free from ice over the strainer. But when the river is covered with ice over the strainer, the difficulty does not occur at any degree of cold. The greatest difficulty occurs when the thermometer ranges from seven or eight degrees to eighteen or twenty degrees above zero, but when the mercury rises above twenty degrees the difficulty soon ceases. The greatest number of detentions, it has been observed, occur at night, and when the sun is obscured by clouds; but when the sun is unclouded, no difficulty is ever experienced. This peculiar stoppage to the flow of water to the pump well has been encountered for many years—first on the strainer of the inlet pipe laid in 1840, again on the one laid in 1850, both of which were located so near the wharf that the ice which formed on them was removed by means of long poles kept at hand for the purpose.

The present inlet pipe was laid in 1858, which, extending farther out from the wharf, and in a greater depth of water, when ice formed as before, it could not be so removed, and all that was done up to a year and a half ago was to wait for the action of the elements on the ice to remove it, which usually takes from three to four hours.

The subject is one that has given your committee much anxiety, from the fact that a continuation of the difficulty for several days together would prevent the delivery into the reservoir of but a limited supply of water. The only reason why this obstacle has not formerly received more attention is that up to a few years past the quantity of water required for daily consumption was so small compared with the quantity now required, that the delay caused by it did not then in the least affect the daily supply.

At the time the present inlet pipe was brought into use (in 1858), less than 2,000,000 gallons of water, and an average of less than fifteen hours' run of the engine per day was sufficient. At the present time, over 4,000,000 gallons of water, and daily engine runs of over twenty-two hours, are required to keep up the supply.

With the rapidly increasing consumption of water, it cannot but be evident that the time will very soon arrive when it will not be safe to permit any detention to the pumping engines, and that this remarkable phenomenon must be solved and the difficulty overcome. Your committee have adopted every accessible means of investigation to obtain suggestions and information on the subject. Attention has been called to it in our published reports, and by the Press. Men of science have been seen and corresponded with, and scientific associations have been requested to investigate the subject, but as yet no complete remedy has been discovered. As no experiments have ever been previously made, and the theory was so strongly presented to us that the trouble was wholly from anchor ice forming on the strainer, we, in the summer of 1866, caused a submarine diver to cut an opening through the downstream side of the strainer, and hang a self-acting door. Under similar circumstances in the winter, when the engine had heretofore been stopped, this door gave a limited supply of water; but from unforeseen causes it had to be abandoned and permanently closed. When the river was entirely covered with ice, no trouble was experienced. The fact induced us to suspend a line of booms from the wharf some distance above and outside the strainer, so as to retain a covering of ice over it when the rest of the river was not covered. This boom was successfully kept in position until the ice firmly formed inside of it, but failed to accomplish the object. The theory that the covering of the entire surface of the river by ice prevented radiation, and by that means the ice did not form on the strainer, was strongly urged; and, if so, any covering over the strainer would answer the same purpose. To test it, we last summer employed the submarine divers, Messrs. Harrington and Phillips, to build a submerged platform of planks immediately over the strainer, which they successfully accomplished, but which, however, proved of no avail, for the stoppages occurred at a higher temperature than before.

On the 29th of December last, while but a small supply of water could be produced, we induced Mr. Harrington to go down to the strainer and make an examination of its condition. Owing to the extreme

coldness of the water and atmosphere (the thermometer marking twenty-six degrees) it was impossible for him to remain down but a short time, but long enough to discover the fact that the strainer, with its surrounding spiles, was one mass of ice, particles collected into a mound some ten feet high and about fifteen feet in diameter, and that large quantities of minute crystals of ice were rapidly passing and adding to the mass already collected. Specimens of the ice were brought to the surface in a bag. It was in sheets and particles thin as paper, translucent, with sharp, pointed edges. A further examination developed the fact that the small amount of water the pump was then receiving came through the lower or down-stream side of the strainer, this being the only point where he could approach it, and which was found but slightly covered with ice. When these facts were ascertained, we thought we were about to solve the problem and provide a remedy for the difficulty, especially as a similar experiment to the one we then proposed to adopt had been successful at the Buffalo Water Works. It was to inclose the strainer, except a part of the down-stream side, so as to prevent these floating particles from collecting on and around it. To do this, a large piece of canvas was prepared of suitable size, and firmly fastened by the diver around the spiles, which, with the platform, completely covered and encircled the strainer, except the down stream side. This was but just completed when the weather became colder, and during the night the thermomcter indicated several degrees below the freezing point, and before daylight the engine stopped for want of water. Preparations were made as speedily as possible for another descent to the strainer. At 11½ o'clock A. M., the diver went down, and this very important fact was ascertained, that with the temperature of the atmosphere at twenty nine degrees, the water at the surface was thirty-three degrees, whilst at the bottom of the river it was thirty-five degrees. At this descent much less ice was found on the strainer and its surroundings than the first time. The lower side was clear, but on the upper side the action of the current had worn the ice into elongated cones, pointing up stream. At this time the pump was receiving a full supply of water. About three hours later, the diver again descended (thermometer thirty-three degrees); he found the ice had entirely disappeared. The wooden platform was removed, since which time no trouble was experienced up to the evening of the 24th inst., when the surface ice of the river was in motion. From 1 o'clock A. M. of the 25th inst. (thermometer sixteen degrees), no water could be obtained till daylight, when the engine was again started, and no further delays have since occurred.

Your committee, by the aid of the submarine diver, have ascertained the fact that at certain temperatures these ice particles are ever present in the river, and are continually passing down by the action of the current, and whatever obstructions they meet with they collect upon. This being the case, we recommend, the coming summer, the entire removal of all spiles and other substances adjacent to the strainer, believing that with nothing but the smooth dome of the strainer for these particles to lodge upon, the quantity that will accumulate cannot very seriously prevent the flow of water to the inlet pipe.

S. G. WIGHT, J. OWEN, } *Committee.*

SMOKE FROM GAS-LIGHTS.—It is pretty generally imagined that the smoking of ceilings is occasioned by impurity in the gas, whereas, in this case, there is no connection between the deposition of soot and the quality of the gas. The evil arises either from the flame being raised so high that some of its forked points give out smoke, or more frequently from a careless mode of lighting. If, when lighting the lamps, the stop cock be opened suddenly, and a burst of gas be permitted to escape before the match be applied to light it, then a strong puff follows the lighing of each burner, and a cloud of black smoke rises to the ceiling. This, in many houses and shops, is repeated daily, and the inevitable consequence is a blackened ceiling. In some well regulated houses, the glasses are taken off and wiped every day, and before they are put on again, the match is applied to the lip of the burner, and the stop-cock cautiously opened, so that no more gas escapes than is sufficient to make a ring of blue flame; the glasses being then put on quite straight, the stop-cocks are gently turned, until the flames stand at three inches high. When this is done, few chimney-glasses will be broken, and the ceilings will not be blackened for years. —*Min. and Scientific Press.*

—Experiments have been made at Birmingham to try the effect of the magnesium light when attached to a balloon in the air. The experiments were striking in effect, the light thrown forth being very brilliant, and illuminating the streets, houses, and crowds of people with a distinctness resembling day.

Correspondence.

Smedberg's "Synopsis of Gaslighting."

NEW YORK, Feb. 22, 1868.

J. R. SMEDBERG, ESQ.:

Dear Sir: You may put down the Manhattan Gas-Light Company for two copies of your "Synopsis" of Gas-Lighting from the London Journal. Of the *value* of the undertaking every company must be aware;—to your *qualifications* for it, your own valuable articles upon the "Practical Management of Gas-works" sufficiently testify. Yours, &c., CHAS. ROOME,
President Manhattan Gas Company.

NEW YORK, Feb. 28, 1868.

JAMES R. SMEDBERG,
Office AM. GAS-LIGHT JOURNAL:

Dear Sir: Please place this company on the list of subscribers to your "Synopsis of Gas-Lighting,"

There are few men in the country who are so well fitted for the task as yourself; and I say this with full knowledge of the discretion and industry which must be exercised to render the work a complete success. Respectfully yours, JOHN H. ADAM,
President New York Gas Company.

NEW YORK, February 21st, 1868.

JAMES R. SMEDBERG, ESQ.,
Office AMERICAN GAS-LIGHT JOURNAL.

Dear Sir: I have learned, with much pleasure, that it is your intention to consolidate the most valuable portions of the "London Journal of Gas-Lighting" into a single volume. I can easily realize its value to Gas Engineers, and your especial qualifications for its faithful execution. My object in writing is to ask you to place my name upon your list of subscribers, and also to assure you that I will do all in my power to induce others to subscribe to your valuable work.

Very truly yours, AMBROSE J. WHITE,
Eng. Metropolitan Gas Co.

The following subscriptions are acknowledged:

MANHATTAN GAS LIGHT COMPANY. (2 copies.)
JOSEPH A. SABBATON, Engineer Manhattan Gas Co.
C. VANDERVOORT SMITH, Supt. " "
NEW YORK GAS LIGHT COMPANY.
AMBROSE J. WHITE, Engineer Metropolitan Gas Co
ISAAC BATTIN, Albany Gas Works.
GEORGE RUGAN, Supt. Terre Haute Gas Co.
C. A. GERDENIER, Supt. Bridgeport Gas Co.
MR. DRAKE.
AMERICAN METER COMPANY.
P. C. SHERMAN, Supt. Brookline Gas Co.
WM. PARRISH, Supt. Seneca Falls Gas Co.
WM. A. STEDMAN, Supt. Newport (R. I.) Gas Co.
MARCUS SMITH, Secretary Wilkesbarre Gas Co.
R. CARTWRIGHT, Eng. People's Gas Co. Cleveland, O.
I. N. STANLEY, Brooklyn.
JOHN J. HALSEY, Treas. Astoria (L. I.) Gas Light Co.
ALONZO C. RAND, New York City.
H. H. EDGERTON, Sec. Fort Wayne (Ind.) Gas Co.
THOS. BUTTERWORTH, Pres Rockford (Ill.) Gas Co.
R. T. COVERDALE, Gas Contractor, Circleville, O.

The Proposed Convention.

NORFOLK, VA., Feb. 8, 1868.

MESSRS. EDITORS: I approve of your proposition to hold a Convention of gas men, and would like to attend such a gathering in May or June.

Very respectfully, CHAS. S. ALLMAND,
President Norfolk City Gas Company.

KEOKUK, IOWA, Feb. 13, 1868.

MESSRS. EDITORS: We heartily endorse the proposition to have a meeting of gas engineers during the coming season, and think it would be of incalculable benefit to the profession. Truly yours,
GEO. M. MCKENZIE, Sec'y,
Keokuk Gas Company.

PETERSBURG VA., Feb. 18th, 1868.

MESSRS. EDITORS: I have read with pleasure the proposition to have a Convention of gas engineers at Cincinnati the coming spring. I have no doubt that great good would result from such a meeting, and would willingly do all in my power to add my mite to the general fund of information. Any time after the 15th of April, it seems to me, would be suitable.

Respectfully yours, &c., WM. H. BAXTER,
Supt. Petersburg Gas Co.

PATENT CLAIMS.

Pertaining to Gas, Mining, Petroleum, Water, etc.

74,542.—LAMP.—John Ingersoll, Cleveland, Ohio.

I claim extending the tube, E, from the top of the lamp down into the hollow stem or shank, D, and so arranged in relation to each other and the globe of the lamp as to form a passage for the oil between the said tube and shank in filling and in burning, substantially as set forth.

74,563.—LAMP.—S. T. McDougal, Brooklyn, N. Y.

I claim, 1st. So constructing a wick tube that either round or flat wick can be employed, substantially in the manner described.

2d. The construction and operation of a telescopic chimney substantially as and for the purposes specified.

3d. Suspending the button to deflect the flame within the chimney, for the purposes fully described.

74,593.—VALVE FOR STEAM ENGINE.—Jos. Reichmann, Dubuque, Iowa.

I claim, 1st. The steam and exhaust ports, so arranged as to cause the motion of the valve piston, or its equivalent, and to check and stop said motion of said piston, or its equivalent, substantially as herein set forth.

2d. The stationary valve-plate, h, constructed as described.

3d. The combination of the valve, d, piston, f, cylinder, c, plate h, and valve, i, constructed as described, and so arranged as to produce self-acting and self-checking motion, substantially as and in the manner herein set forth.

74,648.—OIL BURNING APPARATUS.—A. J. White, Balston Spa, N. Y.

I claim the combination of a wick tube, a, and pipe, b, with a movable reservoir, c, attached to a hollow stem cock, the whole arranged so as to operate substantially as set forth.

OIL EXPLOSIONS.—Explosions are becoming very frequent of late, and are almost always attended with serious, if not fatal results. Pure oil is not explosive when used for illuminating purposes if ordinary care is employed. The impure, adulterated oil, containing, as it does, gasoline, benzine, or other explosive elements, will explode when used in lamps, unless very great care is taken. The best way to avoid all risks is to purchase the genuine article. The difference in price between the pure and the impure is but a trifle. It is advisable to look to quality rather than to price; the adage, "economy is wealth" does not hold good in this case, and we advise those who do not enjoy the blessings of gaslight to buy the very best oil procurable.

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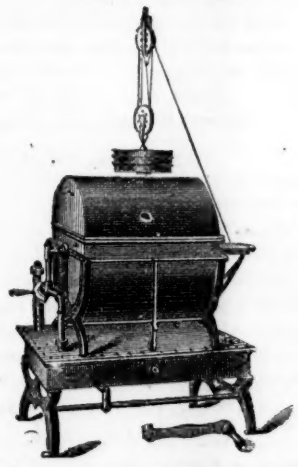

We manufacture eight sizes of the SOLAR GAS MACHINE, ranging from ten to five-hundred light capacity. Every machine is put in operation and fully tested before it is sent off, and is guaranteed to give perfect satisfaction. This new apparatus is the result of 15 years of experience in this special line of manufacture, and we feel warranted in asserting that our machine excels all others of a similar kind in the market. It is much simpler and more efficient than any former manufacture, and is constructed with special reference to safety and durability. There is no possibility of an explosion under any circumstances whatever, nor is the gas tank likely to leak or give out, or any part of the machine to get out of order, if reasonable care is taken of it. From five to fifteen minutes' attention is all that is required to keep any size of machine in perfect working order to supply all the burner-jets in a dwelling or factory.

Testimonials.

SOUTHBORO', March 20, 1867.

MESSRS. O. P. DRAKE & Co., BOSTON:

Gentlemen: In answer to your inquiry, I will say that I had your Gas Machine in use about nine months, manufacturing gas for lighting my store. It gives me but very little trouble. The light is good, clear, and at all times reliable. Its cost is less than half the cost of street gas. As regards safety, I think it very much safer than Kerosene lights.

Yours respectfully,
WM. C. BARNES.

BOSTON, Aug. 22, 1867.

MESSRS. O. P. DRAKE & Co., 8 Bedford-st., Boston:

Gentlemen: I purchased of you, Nov. 18, 1865, one of your Solar Gas Machines, for my house at Auburndale; and from that time until the present, I have enjoyed uninterrupted success with it. The light is uniform, clear and steady, and the best I have ever seen. I have never experienced trouble of any nature from the machine, and consider it invaluable. As to its safety as compared with any other illuminator, I consider it far superior, and have discarded everything else in the shape of oil, fluid, kerosene, etc. Hoping your invention may prove remunerative, I remain,

Yours respectfully
W. E. PLUMMER,
53 Merchants' Exchange.

LAKE FOREST, ILL., Aug. 30, 1867.

CHAS. MATTHEWS, ESQ., Agt of Drake's Solar Gas Mach., Chicago:

Dear Sir: Your letter was received, asking how I liked the working of the Solar Gas Machine put up by you for me. I would say that I have had the machine in constant use for the last 6 months, and am well pleased with it. The light is clear and steady, and the whole apparatus works to my entire satisfaction.

Yours,
WM. S. JOHNSTON, JR.

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We keep on hand range in size from No. 1 to No. 4, and occupy a space for No. 1, 2 x 8 feet, 2½ feet high up to 2½ x 5 feet, 4½ feet high for No. 4, weight of machines from 350 to 1,000 lbs. The No. 1 will supply 5 Argand or 10 bat's-wing burners 6 hours, and No. 4 will supply 50 Argand or 100 bat's-wing burners 6 hours.

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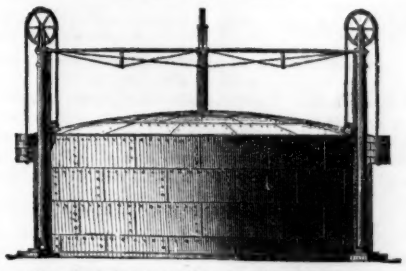

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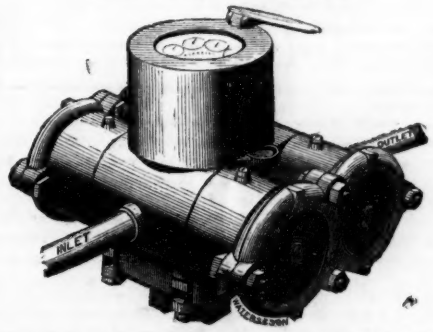

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Gas Stoves made by us are constructed under the immediate supervision of A. L. BOGART, Esq., Analytical Chemist and Gas Engineer. They contain recent improvements of a scientific character—by means of which a PERFECT COMBUSTION is obtained, and the Caloric produced, rendered CHEMICALLY PURE. Too much cannot be said against the use of Gas Stoves for heating apartments—when the products of combustion (Carbonic and Sulphurous Acids are emitted without purification into the atmosphere. Your Physicians will inform you, that this is a subject of vital importance, and worthy of your closest scrutiny—before purchasing. The public are invited to examine into the merits of these inventions.

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M. L. CALLENDER & CO.,

EDITORS AND PROPRIETORS.

MONDAY, MARCH 2, 1868.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of those subjects a pleasure, or a profession.

SUBSCRIBERS would confer a favor upon us by remitting CHECKS or POST OFFICE MONEY ORDERS, as we are frequent losers where money is enclosed in letters.

☞ NEWS AGENCY.—The American News Company, 119 and 121 Nassau street, New York, are agents for this Journal. Newsdealers will please send orders to them.

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Answers To Correspondents.

W. A. S., NEWPORT, R. I.—Mr. Smedberg would state that he does not hold himself in any way responsible for the records tabulated as a supplement to his last article upon the management of works. For the articles themselves he does consider himself responsible. The "Supplement" was only intended to elicit a more general correspondence among companies. The Fort Wayne company state their street-loss at 10.04 per cent. In regard to the table of results from various distillatory temperatures, W. A. S. fails to notice that, while the *percentage* of olefiant gas and the hydrocarbon vapors is less in experiment 5 than in experiment 6 (the proportions being as 100 to 145), the volumes of gas are as 100 to .74. Now by reducing the equation $\frac{693.00}{.74 \times 1.45} = x$, we have by calculation a sperm equivalent, for experiment 6, of 591 lbs., the loss of 2 lbs. being due to the difference in values between olefiant gas and the hydrocarbons. "High heats and short charges," as mentioned in the first paper of the series, fully account for the features of the table.

S. S., MARIETTA, O.—For the fertilizing values of spent lime and ammoniacal liquor, see "Clegg on the Purification of Coal-Gas" in our next number.

G. F. B., AUSTIN, NEVADA.—Your question is too vague for accurate reply. Gases from coal lose their illuminating vapors in passage through pipes at a low temperature, and from two causes: condensation of the vapors, and diffusion of gases. No satisfactory experiments upon the condensibility of the benzine vapors, when carried by either air or coal-gas, have yet been made public.

DISCOVERY IN GAS.—In accordance with instructions received from the Secretary of State for War, some trials in connection with the consumption of gas have been completed at the gasworks of the Royal Arsenal, Woolwich. It has been found, that by combining bitumen with coal in gas retorts, the gas is evolved with great rapidity, and that it gives an illuminating power from one burner equal to twenty-five spermacetti candles. The experiments, which have been conducted by Captain the Hon. Arthur Cocklin, C.B., of the Steam Reserve, Sheerness, have been so satisfactory, that two hundred tons of bitumen have been ordered by the War Department for use of the Arsenal.—*Builder.*

GENERAL TOPICS.

SMEDBERG'S "SYNOPSIS OF GAS-LIGHTING."

Mrs. Glass advises us to catch the hare before cooking it; and the same principle holds good in letters, from political heaviness down to the light and exhilirating gas-literature. (Our readers may slip that hyphen one word further back, if they wish).

And we venture to assert that this is the first instance in which a book is reviewed before it has ever been seen at all.

Our motive, however, is a good one. We are persuaded that this book will be a most valuable accession to our professional libraries, and are fortified in this opinion by the flattering terms in which many of the subscribals already received are couched.

The work will embody the whole English practice during a period of nineteen years. Its beauties and its blunders will be given in unmutilated proportions; with all its accidents, some of which, by the way, remind us of the story of Samuel, the Suliote, who blew himself and forty mere Turks into splinters by tenderly inserting a red-hot poker into a barrel of rifle-powder. Barlow, Hawksley, King, Kirkham, Croll, Hughes, Thompson, Letheby, Bower, Anderson, Lowe, and Frankland, alone make up a sufficing dozen of assurances that each subscriber will get a *quid pro quo* for his fifteen dollars. It is only valuing these distinguished men at $1.25 (currency) each.

The edition will be small, and the actual labor of collating some 10,000 pages of printed matter is so great that it will not be begun until 200 copies are ordered. Will American engineers support the undertaking; or is it to fall still-born?

A MEMORANDUM ON THE DESSICATION OF COAL-GAS.

Companies and consumers alike suffer in cold climates by the freezing of the water-vapors which all coal-gas carries in greater or less proportions. Is it possible to strip these vapors from the gas by the interposition of a purifier containing caustic lime or other absorbent between the gasholder and the street-mains?

The advantages of the plan would be:

1st. The absolute prevention of any stoppage of service pipes by freezing of the water-vapors; the naphthalin, of course, being untouched.

2d. A gain in illuminating value, and in certainty of supply, to the consumer.

3d. A gain in activity of flow which would more than compensate for its loss of two per cent. in volume.

The objections to the plan are all of a practical nature, and may be thus stated:

1st. Cost of apparatus, absorbing material and labor.

2d. The necessity of using dry meters wherever the method may be employed, so as to avoid the reabsorption of water-vapor, unless glycerine were used for filling the wet meter.

We would be very glad to hear from any of our correspondents upon the subject;—our impression, however, is that the objections are fatal.

SOME REMARKS ON PHOTOMETRY.

As to the issue of illuminating values, raised by certain correspondents, we desire broadly to state that there are few men who are not to some degree color-blind, and that it requires such perfect optical qualities, such complete absence of bias, such delicate dexterity in the laws of illuminating gases, to determine the proportions between a white gaslight and the yellow flame of a candle, as to leave us skeptical upon certain results communicated.

We do not, however, wish to be understood as claiming to be *thorough* photometric experts. There is scarcely a man in the country who, to our mind, is *simply perfect* in this specialty—who *fully* understands when to employ his micrometer screw, and when his governor—who can so accurately stop his extinguished candle-wick from smoking, and time so closely the starting of his minute-clocks as to give results which are *absolutely* true. Again, the apparatus employed enters into the count;—the standard candle gives less light per grain when the larger end is burning than when the smaller is being consumed. And if extended trials have determined accurately the constant for correcting this disturbance of illuminating values, we have not heard of it. It occurs to us that the candle might be made intensely cold and actually turned down in a lathe to a truly cylindrical form, the original excess of density in the smaller end of the candle being likely to compensate any compression which the larger end experiences under the stress of the cutters.

To our correspondents, however, one and all, we recommend Sugg's Banister's "Gas Manipulation." It is a book of less than 200 pages, and costs $7.50; but its illustrations are so beautifully executed, its tables so accurate and instructive, and its logic so close, that no photometrist can be considered as thoroughly educated until he has read and digested it. We have more than once alluded to this work in our recent numbers, and consider it as invaluable in the determination of gases, whether with the photometer or the eudiometer. It contemplates the whole range of volumetric and illuminating analyses.

THE ST. LOUIS GAS COMPANY.

We have had the pleasure of meeting Mr. Kingdon, the Secretary, and Mr. Largue, the Inspector, of this very large company.

A cordial correspondence with Mr. Pratt, the company's able Engineer, had some years since, rendered our conversation a very pleasant one to ourselves.

These gentlemen are visiting the larger works of the country with the view of securing photometrical and working data; and we are indebted to them for the Annual Report of the company for 1867, from which we cull the following figures.

Gas made	221,020,000 cubic feet.
Coal used (gross tons)	23,008 tons.
Stone lime used	18,850 bushels.
Gas per gross ton of coals	9,606 cubic feet.
" " bushel of lime	11,725 cubic feet.
The average illuminating value was	14.84 candles.
" maximum " " "	17.82 "
" minimum " " "	12.76 "
Mains laid	103½ miles.
Private consumers	7,324
Public lamps	3,144

The coal employed was the very best Pittsburgh.

THE PITTSBURGH (PA.) GAS COMPANY.

We take the following figures from the Annual Report of the Pittsburgh Gas Company for 1867:

Gas made	118,875,800 cubic feet.
Coal carbonized (gross tons)	12,422 tons.
Average number of retorts in use	63
Gas per ton	9,570 cubic feet.
" " day per retort	5,170 cubic feet.
Services to private consumers	3,665
Public lamps	591
Mains laid	33½ miles.

PHILADELPHIA GAS COMPANY.

We are in receipt of the reports of the Engineer and Cashier of the Philadelphia Gas Works, for 1867, and briefly state their main features.

The total quantity of gas made was 981,642,000 cubic feet, the maximum daily consumpttion being 4,504,000 cubic feet. The fuel percentage was 54 8-10ths of the total production.

The average yield per ton was 9,519 cubic feet. Both clay and iron retorts; 92,660 tons of coal being

carbonized in the irons, and 10,455 in the clay. By some peculiarity of management, the yield per ton was only 9,039 cubic feet from the clays, against 9,574 from the irons.

THE DOVER (DEL.) GAS COMPANY.

We learn from Messrs. Richardson & Robbins, of Dover, Del., that they are "President, Directors, Engineer, Secretary, and the Company" of the gas works in that town. They use the Aubin process, which gives them, in 12 hours' working, 5,000 feet of gas from 300 lbs. of resin, and 14 bushels of sawdust. A bushel of lime purifies 10,000 feet of gas.

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A COMPLETE SET OF FOUR PURIFYING Boxes, 5 feet diameter, with four large wooden Trays, Centre Seal, and 48-inch Station Meter, with 6-inch connections, also a set of 6-inch horizontal Condensers. Apply at the office of the Elizabethtown Gas-Light Company, Elizabeth, N. J. 197

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A MANAGER OF SIX YEARS' EXPERIENCE desires a Situation with some Gas Company of moderate size. He is a practical Gas-fitter, and familiar with accounts, and can furnish satisfactory references. Address R. H., care AMERICAN GAS-LIGHT JOURNAL. 197

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GAS ENGINEER,

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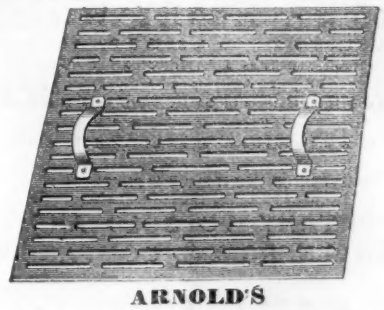

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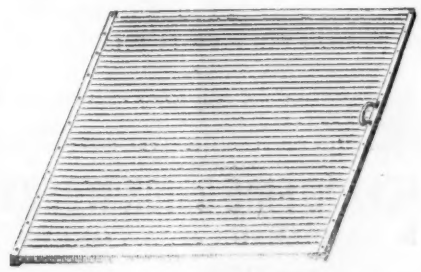

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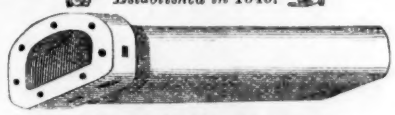

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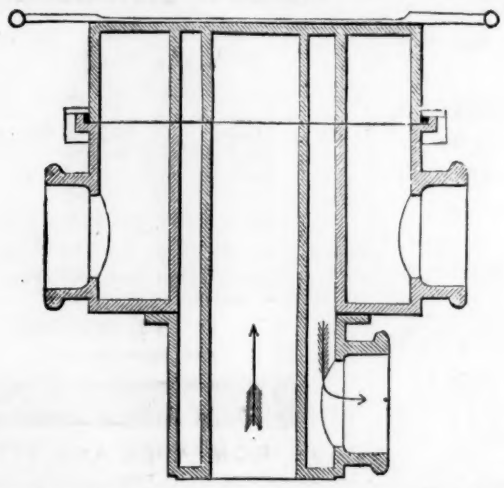

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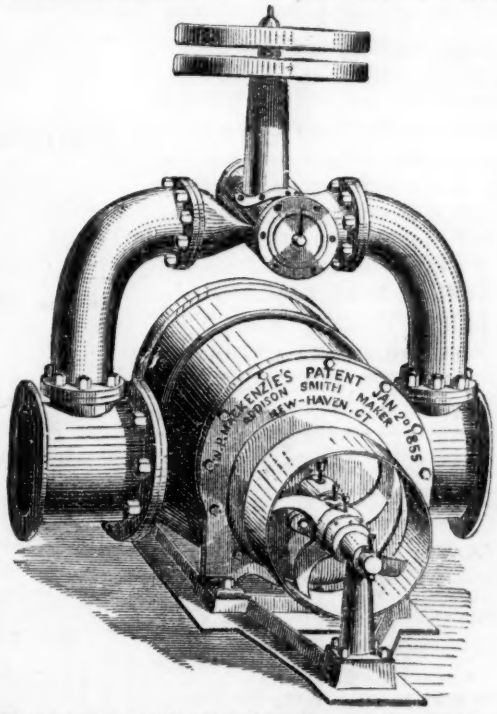

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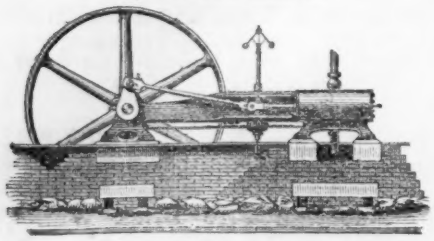

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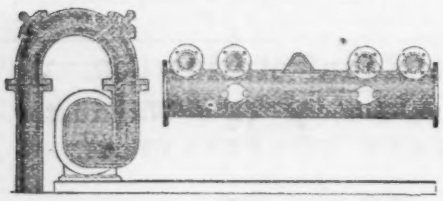

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Recent improvements enable us to supply this pipe at a less price per foot than common lead pipe. To furnish the cost we should know the head or pressure of water and bore of pipe.

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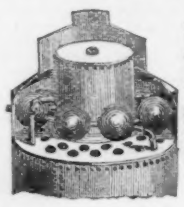

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Metal Top Lamp Chimney,

First Quality Extra Annealed Glass.

Will not crack or break from sudden changes of temperature, is readily cleaned, and with ordinary care should last just as long as the lamp on which it is used. Liberal discount allowed to the trade. Samples sent on receipt of fifty cents.

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It is a combination of

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A mastic—it adapts itself to every shape and slope. Non-combustible, impervious, non-expansive, and undecaying.

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The only roofing material ever discovered that will resist the action of the elements as long as the structure it protects. Being susceptible of little, if any wear, from exposure, and

Perfectly Fire-Proof,

It is unequalled as a coating for Railroad and Farm Buildings Fences, Bridges, bottoms of Vessels, Vaults, etc.

GAYLORD'S PATENT COUPLINGS,

Fig 5

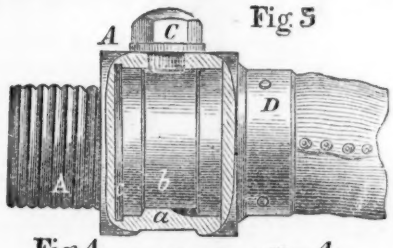


Fig 4

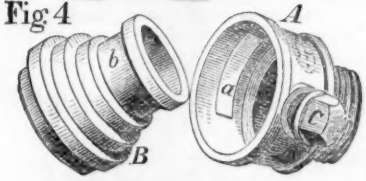
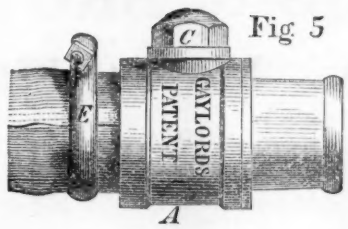


Fig. 5



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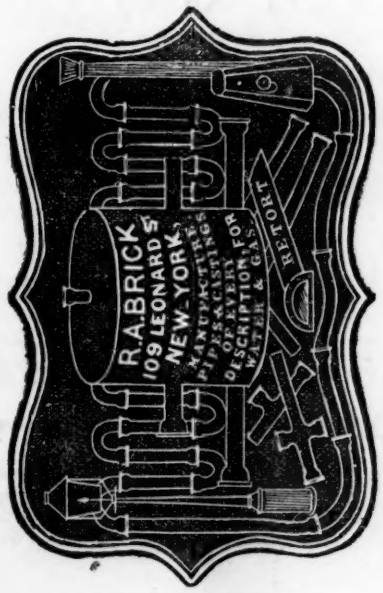
BERGEN IRON WORKS,



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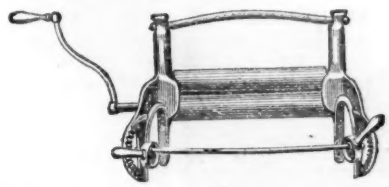
IT IS THE ONLY RELIABLE

Self-Adjusting Wringer.



No Wood-work to Swell or Split. No Thumbscrews to get out of order. Warranted with or without Cog wheels.

It took the First Premium at Fifty-seven State and County Fairs in 1863, and nearly double that number in 1864, and is, without an exception, the *best* Wringer ever made. Patented in the United States, England, Canada, and Australia. Agents wanted in every town, and in all parts of the world. Energetic agents can make from $3 to $10 per day

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That Iron well galvanized *will not rust.*
That a *simple* machine is better than a complicated one.
That a Wringer should be *self-adjusting, durable, and efficient.*
That thumb-screws and fastenings cause *delay* and *trouble* to regulate and keep in order.
That wood soaked in water will *swell, shrink,* and *split.*
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That the Putnam Wringer, with or without cog wheels, will *not tear the clothes.*
That cog-wheel regulators are not essential.
That the Putnam Wringer has *all* the advantages, and *not one* of the disadvantages above named.
That all who have tried it pronounce it the *best* Wringer ever made.
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We might fill the paper with testimonials, but insert only a few to convince the skeptical, if such there be; and we say to all, *test* Putnam's Wringer. Test it *thoroughly* with *any* and any others, and if not entirely satisfactory, return it;

PUTNAM MANUFACTURING CO.—*Gentlemen:* I know from practical experience that iron well galvanized with zinc will not oxydize or rust one particle. The Putnam Wringer is as near perfect as possible, and I can cheerfully recommend it to be the best in use. Respectfully yours,

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PRICES—$8, $9, and $10.
Sample Wringers sent, express paid, on receipt of price.
Manufactured and sold, wholesale and retail, by

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HIGHEST PREMIUM

Shuttle Sewing Machine.

Has only to be seen and operated to be appreciated.

Call and see for yourself before purchasing. Please bring samples of various kinds of thread (such as is usually found at stores), and various kinds of fabric, which you know the former most popular sewing machines either cannot work at all, or at best very imperfectly.

SUPERIORITY

over any other machine in the market will be seen at a glance:

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WEED MACHINE,

with so little trouble, make it equal, if not superior, to six machines combined; for instance, it binds, tucks and sews on the band at the same time, and in fact, the

WEED NO. 2 MACHINE,

as before stated, is equivalent to a combination of any six ordinary machines.

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No. 2. Oil Black Walnut, Ornamented with Hemmer.	$60,00
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Continue as heretofore at the OLD ESTABLISHMENT, Nos. 1115 and 1117 Cherry Street, Philadelphia,

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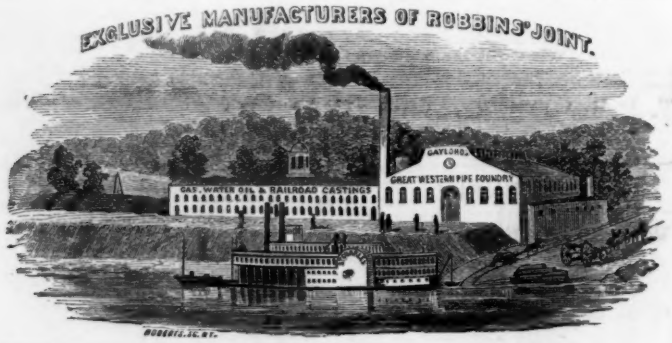

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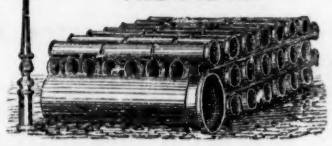

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SEWING MACHINE

Should be known in

IN EVERY TOWN.

To accomplish this at once and save the expense of a *Travelling Agent*, we offer thus, viz:

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Our new Manufacturing Machine is sold on the same terms as the Family Machine.

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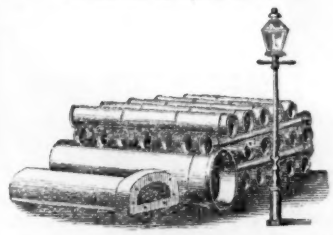

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Have been placed on the route to Savannah by the Atlantic Mail Steamship Company of New York, and are intended to be run by them in a manner to meet the first class requirements of the trade. The cabin accommodations of these ships are not excelled by any Steamers on the coast, and although their carrying capacity is large, their draught of water enables them to insure a passage without detention in the river

San Jacinto,	Saturday,	Oct.	6
San Salvador,	..	"	13
San Jacinto,	..	"	20
San Salvador,	..	"	27
San Jacinto	Saturday,	Nov.	3
San Salvador	..	"	10
San Jacinto	..	"	17
San Salvador,	..	"	24

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NEW PATENT

Pianos.

RAVEN & BACON.

(Established 1829.)

Warerooms Nos. 644 & 646 Broadway, N Y.

Manufacturers of Piano Fortes, with their Patent Combination Sounding-boards,

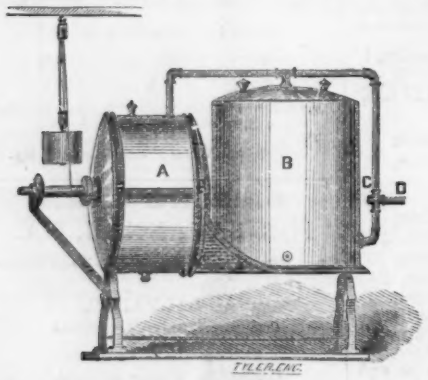
PATENTED AUGUST 14th, 1866.

This invention, introduced exclusively into our Pianos, is of the greatest advantage to the tone of the Instrument, as it affects the sounding-board the very soul of the Piano, and produces thereby a pure liquid tone greatly superior in quality and power to that of the ordinary Piano. The sounding-board released from its connection with the Piano case, and resting upon under sounding-boards, is relieved from the rigidity caused by such connection, and its vibratory quality increased. Our Pianos are first class in every respect, and purchasers will have not only our own guarantee as to their quality, but also the guarantee of the reputation of the instrument, obtained from the experience of our patrons who have used them for a generation. All lovers of this eminently household instrument, as well as parties proposing to purchase new Pianos, are invited to call and examine our assortment. 96-1y

Springfield Gas Machine.

The next best thing, perhaps, to coal gas itself for illuminating purposes is some efficient and simple apparatus for carburetting atmospheric air as a substitute. For a moderate number of burners this kind of light is often found quite economical and convenient. For public buildings, mills, factories, hotels, country residences, and the like, where the amount of gas needed will not warrant erecting gas works, the apparatus illustrated and described herewith, will be found an excellent means to obtain a good light.

It consists of a carburator, or a reservoir, B, for the naphtha or gasoleine, and a species of meter or air-pump, A, to force the air into and through the reservoir where it becomes charged with the volatile hydrocarbon vapors. It then passes on through pipes C and D, and is distributed to the burners in the usual way for gas. The drum of the meter, A, is actuated by a



cord and weight with pulleys, as represented in the engraving. This weight requires winding two or three times a week ordinarily, and it can be done while the lights are burning, without the inconvenience some machines encounter—namely, putting out the lights.

These machines are approved by the National Board of Fire Underwriters, and property containing them are insured at the same rates as when coal-gas is employed, we are told.

The Springfield Gas Machine Company, of Springfield, Mass., manufacture and put up these machines, and we learn they are very successful in making them popular

For further particulars address C. N. Gilbert, Springfield, Mass., who is agent for these machines.

Late Mining News.

[Compiled from our Exchanges of January 25.]

Alpine Co., Cal.—A new strike is reported in the I X L Co.'s mine. The Tarshish is showing ore at every step. We learn that they have struck a large deposit of the rich, soft or sack ore in the Tarshish shift, from which 24 sacks have already been taken, and lots more in sight.

Butte Co., Cal.—The miners are taking advantage of the water. As to mining, so far it has been a glorious season. No one who has been willing to work has laid by from necessity.

Calaveras Co., Cal.—The amalgam recently taken out of the Washington mine, of which mention was made in our previous issue, was taken from only 12 tons and 700 lbs., and the returns from San Francisco show a yield of $992 instead of $882.

At Camanche, Frankfort and Haightville there are about 300 white and 200 Chinamen at work. Nearly all the claims are paying—the best ones averaging $7 or 8 per day to the hand.

Colorado.—Thirty pounds of ore from the Comet lode, Griffith mountain, yielded at the rate of $455 per ton.

Dacota.—The Reese River *Reveille* says: We are in receipt of a communication dated January 1st, concerning the Sweetwater district, giving an account of late discoveries of rich quartz and placer mines. All the surroundings of the district are noted in superlatives. The mines of Sweetwater may turn out to be all that the writer claims them to be; but that remains to be seen. In the meantime careful men will wait patiently.

Idaho.—The Oro Fino mine still continues to yield large quantities of gold bearing rock—in much of which gold is plainly discernible to the naked eye. The tunnel is 670 feet in length. The mine is now in such a shape that almost unlimited quantities of ore can be taken out.

Reese River, Nev.—In the Chihuahua mine of the Centenenary Co., in Newark district, there has been extracted up to the present time, fully 1000 tons of ore, and the supply is not exhausted, but there is a considerable quantity of ore within reach of the stoppers. Extraordinary specimens of rich ore have been produced by the mine, the choicest of which yielded by assay at the rate of $8,000 per ton.

Washoe, Nev.—On the 16th January a drift running westerly from the Hale & Norcross main shaft, on the 930 foot level, tapped a large vein of water. This is supposed to come from the main lead. In cutting the vein of water they also found some very fine ore, but little is known, as yet, of the extent of the deposit.

The Gould & Curry Co. are taking out about sixty tons of ore per day from their upper levels. Owing to their having exhausted their supply of fuel, the mill is now lying idle, and no work is being done on the engine shaft at the mine. Meantime the ore taken out is stored at the mouth of their lower tunnel, ready for crushing as soon as the roads improve sufficiently to allow of their obtaining a supply of fuel with which to run their mill.

A fine deposit of ore has been struck in the lower level of the Crown Point mine.

The Gold Hill *News*, speaking of the body of water lately struck at the 930 foot level of the Hale & Norcross mine, says: This new strike is probably in the main Comstock ledge, west of the smaller pay streak they cut through the other day, and in the vicinity of the winzes sunk for the lower level of the old workings. From all we can learn the recent rise in the Hale & Norcross stock is based upon pretty good prospects.

New Mexico.—In relation to the Cimaroon mines, Elizabeth district New Mexico, we learn that this country has not been prospected except a small portion in the vicinity of Willow Gulch, and the indications for miles around are good. Rich mines have been struck every week. They are dry now—the one thing needful is water, and it will be here in abundance by the 1st of April. A company of miners from Georgetown and Central were prospecting recently about 20 miles west of this on the Rio Hounda, a tributary of the Rio Grande. They found some old Spanish diggings, said to have been worked several hundred years ago. They opened an old shaft and found the skeleton of a man, standing upright. He had some mining tools, and in his pan they found a tolerable prospect. La Blanco, the veteran mountaineer and trader, acted as their guide. He is familiar with the legends and traditions of the Pueblo Indians, and knows, if any man does, the location of these ancient mines. He stated to the company, that according to Indian tradition a large number of Spaniards had been buried alive by them while working in the mines, and this seems to corroborate their story.

Advertising Index.

☞ In looking for advertisements, see figures 1 to 9, within brackets, at head of advertisement pages.

GAS-BURNERS, APPARATUS, ETC.

Arnold's Metallic Gas Trays—T. G. Arnold, 334 and 336 West 21st street, N. Y. ... 3
American Meter Company, 512 West 22d street, New York ... 8
Automatic Gas Purifier—State Rights for sale—Wm. C. Turnbull, care of T. C. Babcock, 59 Broadway, or office of the American Gas-Light Journal ... 2
Cast Iron Pipes and Fittings—B S. Benson, 32 East Monument street, Baltimore, Md. ... 4
Gasoleine,—J. W. Wheelock, 284 Pearl st., New York ... 4
Gas Coals—Bird. Perkins & Job, 104 Wall street, New York ... 4
Gas Engineers and Contractors—Hoy, Kennedy & Co., 111 Liberty street, New York ... 4
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Gas Meter Manufacturers—Harris & Bro., 1117 Cherry street, Philadelphia, Pa. ... 8
Gas Superintendent—C. M. Cresson, 417 Walnut st., Phil., Pa. ... 9
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Gas Burner—T. G. Arnold, 224 and 226 West 21st st., N. Y. ... 9
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Solar Gas Machines—Smith & Drake, 726 Broadway ... 2
Second-Hand Purifiers Wanted—Apply at office of this paper ... 6

FOUNDRIES.

Bergen Iron Works—Driving Pipes and Bands—R. A. Brick, 109 Leonard street, N. Y. ... 7
Columbian Iron Works—Wm. Taylor & Sons, 11, 13 and 15 Adams street, Brooklyn, N. Y. ... 6
Dealers in Iron, Copper, Brass, etc.—T. Cassidy & Co., corner of Bridge and John streets, Brooklyn, N. Y. ... 4
Erie Basin Iron Works—Elizabeth, Dwight and Van Dyke sts., South Brooklyn, N. Y ... 2, 6
Gaylord's Great Western Pipe Foundry—Office 90 and 92 Broadway, Cincinnati, Ohio ... 8
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CLAY RETORT WORKS.

Bay State Clay Retort Works, 125, 127 Water st. Boston, Mass. ... 6
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Mining Machinery—A. Hitchcock, 4, 6, Pine st., New York ... 4
Sodium Amalgam &c.—Prof. Wurtz, 26 Pine st., New York ... 4
School of Mines, Columbia College, East 49th st. " ... 2

LAMPS, STOVES, PETROLEUM, ETC.

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Paraffine Oil—G. H. Bronson, 132 Maiden Lane New York ... 4
Chimney Top—C. H. Reichmann, 45 Fulton st. " ... 7

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LIGHT, HEAT MINING INTERESTS.

PETROLEUM, WATER-SUPPLY, AND SCIENTIFIC SUBJECTS GENERALLY.

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☞ All communications to be addressed to "The Editors," No. 22 Pine Street, New Yo

MAR. 15 1913